Tremolite Reduction Program
Progress Report Summary

W. R. Grace & Co.

Construction Products Division

20082189

F.W.E.
10-17-79

I. Background

Prior to 1968 little was known about the health hazards associated with asbestos fibers. The Zonolite Company was aware of the tramp mineral, tremolite, in its Libby Montana Vermiculite deposit and investigated the feasibility of separating and concentrating tremolite as a saleable product. In the late 1960's the Libby Mine & Mill sampled the work place environment by the impinger method for total dust, as this was the acceptable method of sampling for employee exposure to dust including asbestos. The ACGIH had established threshold limit values (TLV) of 20 MPPCF for total nuisance dust and 5 MPPCF for asbestos dust. Typically, 50% of the personnel samples at Libby exceeded the 5 MPPCF TLV.

In 1968, the U.S. Public Health Service and later Johns-Manville Company adopted the recently developed membrane filter method of sampling and Phase Contrast Microscopy Method of analysis. In 1969, CPD adopted the membrane filter method and received training from Johns-Manville. At that time there were no fiber TLV's established but it appeared that the U.S. Public Health Service would establish 12f/cc as the TWA for asbestos fibers. Johns-Manville and CPD targeted for 6 f/cc. Although OSHA Standards were promugated in 1972 and asbestos TWA limits were 5 f/cc, very little was done by CPD until the standards were lowered to 2.0 f/cc TWA-10 f/cc ceiling in 1976.

In the period 1970-1976 CPD's main fiber exposure reductions efforts centered around CPD's employees at the mine, mill and expanding plants. During this period, new plants were built including the Libby Mill and existing facilities upgraded. From CPD's vermiculite product standpoint, little effort was placed on fiber reduction except in the area of Mono Kote, a fireproofing material. To comply with the National Emission Standards for Hazardous Air Pollutants (NESHAPS), commercial asbestos was removed from the Mono Kote formulation and the product complies with the <1% asbestos limitation.

II. Product Identification - Fiber Exposure

In 1976 CPD assigned, on a full time basis, a person to coordinate, fiber reduction activities including liaison with trade associations and regulatory agencies. In order to determine what user exposure to tremolite fibers are when handling Libby and South Carolina expanded vermiculite, CPD conducted extensive product air sampling during the first quarter 1977. In general, these results were very favorable and CPD was able to make the statement that "in normal use, none of our product exceed the present allowance level (as defined by OSHA) for fibrous tremolite and most are well below OSHA limits."

III. Consumer Products

A. Attic Insulation

In the second quarter of 1977, emphasis was placed on reducing fiber exposure to the lowest possible level in all consumer products. Management established fiber exposure targets of 1.0 f/cc TWA and 5 f/cc ceiling by 1/1/78 and 5 f/cc and 5 f/cc by 1/1/79 and a long range target of .2 f/cc and .1 f/cc. With these targets, a concentrated

effort was placed on attic fill as this was the primary consumer item. The Weedsport, N.Y. expanding plant was selected as the test site and in order to determine results of process changes or modifications, a simulated attic was constructed over the Weedsport office. Simulated attic tests indicated that Libby #1 and #2 screened over a 16 mesh screen and all cyclone fines removed, could achieve the target TWA exposure of 0.5 f/cc and 5 f/cc ceiling. Because of the need to supply Libby #3 attic, simulated attic tests were conducted to see if screening and pulling the fines would result in the same low values that were determined on Libby #1 and #2. Unfortunately screened #3 TWA and ceiling results were just under the OSHA Standards but exceeded CPD's target of 1 f/cc and 5 f/cc for 1/1/78.

Prior to removing cyclone fines and screening product to remove heavy particles, extensive test work had been conducted on binding expanded vermiculite. Although numerous binder additives were evaluated (oil emulsion, lignin, sodium silicate, potassium silicate, starch and CMC) it was the moisture that suppressed dust and fiber.

The main drawback to bound attic insulation was product shrinkage (15% for #1) and lack of market acceptance when bound with more than 0.30 QTS/CF. In order to meet attic insulation demand in 1977, C-3 was bound with 0.5% CMC at 0.20 QTS/CF. This bound product was acceptable in the market place and simulated attic fiber exposure. Test results met the target goal of 0.5 f/cc TWA and 5 f/cc ceiling.

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I. TWA Fiber Analysis - Simulated and Actual Attic Test

Prior to using the simulated attic as a control test procedure for fiber release/exposure, a controlled drop test procedure was used. Drop test data could be used as an indicator of swings but had little correlation value to user exposure. Approximately 150 drop tests were conducted using test facilities shown in the attached photographs.

Simulated attic test results are listed on the attached summary sheets. The results are an average of all tests of like operating conditions including swings between vermiculite concentrate shipments. Also attached for reference are results for each test which show this swing between test No., test date and concentrate shipments.

Results of actual attic insulation tests indicate user fiber exposure approximately twice the values of simulated attic. The reasons for this difference are as follows:

a. Simulated attic is similar to year 1900 home with walk in attic.

b. All actual attics were modern ranch type with little headroom. Insulation was spread by person on his knees or bent over position.

c. To place insulation in eave area, material had to be pushed generating dust.

d. Most actual attics were hot, difficult to reach and worker attitude was get in - do the job - and get out.

The TWA values are based on a person spreading vermiculite attic insulation only 2 hours in any 8 hour day.

2. Bound L-1&2 Attic Insulation

Starting the week of October 15, 1979, all L-1 & L-2 attic insulation will have cyclone fines removed, screened over a 16 mesh screen and bound with a 0.5% CMC at an addition rate of 0.25 QTS/CF. Based on simulated attic test (2 each) on September 28, 1979, the TWA fiber exposure for unbound material was 0.105 f/cc and for bound 0.092 f/cc. These results are the lowest achieved to date and may reflect a mining condition rather than a trend.

An ongoing program of monthly testing has been initiated.

B. Horticultural Products

Consumer user exposure to tremolite fibers in horticultural vermiculite (Terra-Lite) and potting soils (Redi-Earth) was based on simulated tests per the attached test procedure. In all cases no fibers were observed in the counting fields.

In the test of vermiculite in lightweight fertilizer, approximately 60,000 sq. ft. of lawn area at an apartment complex was spread with Scott's Turf Builder at the regular coverage rate. During the sampling period (350 min.), no fibers were observed in the counting fields.

VII. Fiber Reduction Research

Tremolite fiber reduction research has been carried on by Libby and Cambridge research departments as well as consultants such as the North Carolina University Minerals Research Laboratory. Removal/separation methods investigated are heavy media separation, electrostatic separation, flotation, and air classification. All methods show some potential on lab bench scale but existing technology has not been developed to implement economical removal/separation circuitry in the Libby mill.

There have been certain indicators during the fiber reduction program that indicate that the lower the rock content in the ore concentrate, the lower the user fiber exposure. Also, tests show that screening reduces fiber exposure by reducing heavy particles which are high in Tremolite content. The basic question is how clean is clean and what does the mill have to do to reduce Tremolite fiber exposure to the lowest possible level. With that objective in mind, Libby produced on pilot mill circuitry a sample lot of #1 and #2 super-clean concentrate. Comparing super clean to production L-182 concentrate, rock content was reduced 82% and 74% respectively and concentrate Tremolite content reduced 85% and 49%. Making the same comparison for simulated and actual attic tests, the TWA fiber exposure reduction is 57% and 52% respectively. With a product total Tremolite content (fibrous and nonfibrous) of 0.041% and 0.016%, the average fiber exposure is 0.73 f/cc and TWA of 0.18 f/cc.

Research and test data indicate that CPD operating conditions at the mine, mill and expanding plants may be at optimum conditions and any further reduction in fibrous Tremolite may be in the area of product modification such as binding. We are also at that point where fiber exposure levels are the lowest detectable by present sampling/analysis techniques and the potential degree of error will drastically affect results.

VERMICULITE ATTIC FILL

SIZE L-1

	No. Tests	Fiber Analysis (f/cc) MIN.	MAX.	AVE.	TWA (f/cc)
A. SIMULATED ATTIC					
1. UNSCREENED UNBOUND	3	4.36	5.96	4.91	1.229
2. SCREENED (HM) UNBOUND END OF SILO	3	2.98	3.90	3.44	0.86
3. SCREENED (HM) UNBOUND	11	1.45	2.01	1.73	0.433
4. SCREENED (HM) UNBOUND SUPER CLEAN	3	0.617	0.843	0.73	0.183
5. SCREENED (14M) BOUND 0.92 OPS/CC	2	2.235	2.785	2.513	0.628
6. SCREENED (14M) BOUND 0.67 OPS/CC	2	1.545	1.97	1.758	0.439
7. SCREENED (HM) BOUND 0.98 OPS/CC	2	0.92	1.43	1.175	0.294
B. ACTUAL ATTIC					
1. SCREENED (HM) UNBOUND END OF SILO	1	2.72	6.41	3.823	0.956
2. UNSCREENED UNBOUND	1	3.62	4.28	3.95	0.988
3. UNSCREENED BOUND 0.37 OPS/CC	1	1.94	2.53	2.2351	0.559
4. SCREENED (14M) UNBOUND SUPER CLEAN	2	0.78	3.32	1.47	0369

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VERMICULITE ATTIC FILL
SIZE 1-2

	No Tests	Fiber Analysis (f/cc) MIN.	MAX.	AVE	TWA (7/8)
A. Simulated Attic					
1. Unscreened Unbound	4	0.74	1.35	1.04	0.261
2. Screened (14M) Unbound	9	1.31	1.75	1.53	0.382
3. Screened (14M) Unbound Super Clean	3	0.52	0.96	0.74	0.185
4. Screened (14M) Bound 0.2 oz/sf	1	3.13	3.70	3.415	0.854
5. Screened (14M) Bound 0.4 oz/sf	1	2.44	2.44	2.44	0.61
B. Actual Attic					
1. Screened (14M) Unbound Super Clean	4	0.88	2.37	1.635	0.409

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VERMICULITE ATTIC FILL
SIZE 1-3

	No. TESTS	FIBER ANALYSIS (f/cc) MIN.	MAX.	AVE.	TWA (f/cc)
A. SIMULATED ATTIC					
1. SCREENED (14M) UNBOUND	12	4.59	6.35	5.46	1.365
2. SCREENED (16M) UNBOUND	4	0.77	1.01	0.89	0.223
3. SCREENED (20M) UNBOUND	4	2.57	2.99	2.75	0.687
4. SCREENED (14M) BOUND 0.2 QTS/CF	6	1.19	1.92	1.55	0.389
5. SCREENED (14M) BOUND 0.10 QTS/CF	4	2.70	3.61	3.17	0.793
6. SCREENED (16M) BOUND 0.10 QTS/CF	4	2.01	2.90	2.21	0.552
7. SCREENED (20M) BOUND 0.10 QTS/CF	4	2.67	3.18	2.92	0.731
B. ACTUAL ATTIC					
1. SCREENED (19M) UNBOUND	1	7.97	11.22	8.958	2.239

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CONSUMER HORTICULTURAL PRODUCTS

SOIL MIXES — LIGHT WEIGHT FERTILIZER

	PRODUCT	VERMICULITE SIZE	TYPE TEST	FIBER ANALYSIS (f/cc) MIN.	MAX.	AVE	TWA	SEE NOTE
1.	SCOTTS TURF BUILDER	1-4	ACTUAL FIELD SITE 60,000 FT²	<0.02	<0.04	<0.03	<0.0076	
2.	TERRA-LITE VERMICULITE (50% ASB, 50% VERM)	1-3	SIMULATED	<0.14	<0.14	<0.14	<0.035	
3.	TERRA-LITE VERMICULITE (50% ASB, 50% VERM)	SC-3	SIMULATED	<0.14	<0.29	<0.20	<0.05	
4.	REDI-EARTH	1-3	SIMULATED	<0.14	<0.14	<0.14	<0.035	
5.	REDI-EARTH	SC-3	SIMULATED	<0.14	0.29	0.058	0.015	

NOTE:

LESS THAN (<) VALUE MEANS NO FIBERS WERE OBSERVED IN THE COUNTED FIELDS. WHERE NO FIBERS WERE OBSERVED IN THE COUNTED FIELDS, GRACE PLUGS IN ONE (1) FIBER IN THE ANALYSIS CALCULATION SO THAT NO ANSWER IS ZERO (0) f/cc. THE < SIGN QUALIFIES THE QUANTITATIVE VALUE. IN THE SCOTTS TURF BUILDER ANALYSIS TEST NO FIBERS WERE OBSERVED IN 1000 COUNTED FIELDS DURING THE 350 MIN (60,000 FT²) TEST PERIOD.

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LIBBY #1 SIMULATED ATTIC TESTS
UNSCREENED — ALL CYCLONE FINES REMOVED

8/30/01
REV #1

TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS f/ml MIN.	MAX.	AVE	TWA 8/8
9A	5/11	5/18	4.28	5.70	4.99	1.248
9A	5/11	6/2	5.34	6.41	5.875	1.469
17A	5/25	5/31	3.47	4.28	3.88	0.97
		AVE.	4.36	5.46	4.91	1.229

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LIBBY #1 SIMULATED ATTIC TESTS 6/26/17

SCREENED (14 MESH) - ALL CYCLONE FINES REMOVED Exh. #1

	TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS (f/mL) MIN.	MAX.	AVE	TWA 8/8
1							
2	12AS	5/11/17	5/18	1.43	1.66	1.545	0.386
3							
4	12AS	5/11	6/2	2.85	2.85	2.85	0.713
5							
6	17AS2	5/25	5/31	3.42	5.70	4.56	1.14
7							
8	24AS1	7/25	8/2	0.78	1.04	0.91	0.228
9							
10	24AS2	7/25	8/2	1.47	1.77	1.62	0.405
11							
12	24AS3	7/25	8/2	1.04	1.31	1.425	0.356
13							
14	24AS4	7/25	8/2	1.01	1.26	1.135	0.284
15							
16	25AS1	7/25	8/1	0.55	1.38	0.965	0.241
17							
18	25AS2	7/25	8/1	1.76	1.76	1.76	0.44
19							
20	25AS3	7/25	8/1	1.07	1.07	1.07	0.268
21							
22	25AS4	7/25	8/1	0.61	1.83	1.22	0.305
23			AVE	1.45	2.01	1.73	0.433
24	SUPER CLEAN 1SC-1&2	3/28/17	4/4/17	0.95	0.95	0.95	0.238
25							
26	1SC-3&4	3/28	4/4	0.45	0.68	0.565	0.141
27							
28	1SC-5&6	3/28	4/4	0.45	0.90	0.675	0.169
29			AVE	0.671	0.893	0.783	0.183
30	END OF SILO 1SA-1&2	6/19	6/22	2.40	4.28	3.34	0.835
31							
32	1SA-3&4	6/19	6/22	3.42	3.42	3.42	0.855
33							
34	1SA-5&6	6/19	6/22	3.13	3.99	3.56	0.890
35			AVE	2.98	3.90	3.44	0.86
36							
37							

20082201

FIBER EVALUATION — LIBBY #1

DATE PROD.	MATERIAL IDENTIFICATION	SAMPLING CONDITIONS DATE	LOCATION	FIBER ANALYSIS (f/ml) MIN.	MAX.	AVE/TWA	%
5/11	TEST 12AS	5/12	DROP TEST	5.99	23.94	11.095/	
	CONTROL	6/2		6.77	13.60	10.505/	
	14 MESH SCREEN	5/18	SIMULATED ATTIC	1.43	1.66	1.545/0.386	
		6/2	20-4 CF BAGS	2.85	2.85	2.85/0.713	
5/11	TEST 12BS	5/12	DROP TEST	1.28	5.99	2.923/	
	0.5% CMC	5/31		0.43	2.99	1.853/	
	0.01% WAR	5/18	SIMULATED ATTIC	1.34	1.87	1.605/0.401	
	0.42 OTS/CF	6/1	20-4 CF BAGS	3.13	3.70	3.42/0.855	
	14 MESH SCREEN		AVE	2.235	2.785	2.513/0.628	
5/11	TEST 12CS	5/12	DROP TEST	0.43	1.71	1.284/	
	0.5% CMC	6/1		0.43	0.43	0.43/	
	0.01% WAR	5/18	SIMULATED ATTIC	0.95	1.19	1.07/0.268	
	0.67 OTS/CF	6/1	20-4 CF BAGS	2.14	2.75	2.445/0.61	
	14 MESH SCREEN		AVE	1.545	1.97	1.677/0.419	
5/11	TEST 12DS	5/12	DROP TEST	0.43	2.14	1.287/	
	0.5% CMC	6/1		<0.43	0.86	0.43/	
	0.01% WAR	5/17	SIMULATED ATTIC	0.50	1.26	0.88/0.22	
	0.98 OTS/CF	6/2	20-4 CF BAGS	1.37	1.60	1.47/0.368	
	14 MESH SCREEN		AVE	1.092	1.43	1.175/0.294	
5/25	TEST 17A	5/27	DROP TEST	9.83	23.09	16.247/	
	CONTROL						
	NO SCREEN	5/31	SIMULATED ATTIC	3.47	4.28	3.55/0.97	
			20-4 CF BAGS				
5/25	TEST 17AS1	5/27	DROP TEST	3.42	8.12	5.465/	
	CONTROL OVER						
	5 MESH SCREEN	5/31	SIMULATED ATTIC	3.71	4.28	4.01/1.003	
			20-4 CF BAGS				
5/25	TEST 17AS2	5/27	DROP TEST	4.28	9.41	6.845/	
	CONTROL OVER						
	14 MESH SCREEN	5/31	SIMULATED ATTIC	3.42	5.70	4.56/1.14	
			20-4 CF BAGS				

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LIBBY #2 SIMULATED ATTIC TESTS
UNSCREENED - ALL CYCLONE FINES REMOVED

8/24/81
Rev.

	TEST NO.	DATE FOOD.	DATE TESTED	FIBER ANALYSIS (f/cm³) MIN.	MAX.	AVE.	TUB %
1							
2	21A	7/25	7/28	1.60	2.40	2.00	0.50
3							
4	21A2	7/25	7/28	0.71	1.66	1.185	0.23½
5							
6	21A3	7/25	7/28	0.21	0.64	0.425	0.106
7							
8	21A4	7/25	7/28	0.451	0.68	0.565	0.14¼
9							
10			AVE.	0.74	1.35	1.04	0.26¼
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20082203

LIBBY #2 SIMULATED ATTIC TESTS

SCREENED (14 MESH) - ALL CYCLONE FINE REMOVED

REV #1

	TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS (f/ml) MIN.	MAX.	AVE.	THIA 2/3
	13AS	5/25/77	7/19/77	4.78	5.78	5.28	1.32
	22AS1	7/25	7/27	1.34	2.14	1.74	0.435
	22AS2	7/25	7/27	2.00	2.57	2.285	0.571
	22AS3	7/25	7/27	0.45	0.90	0.675	0.169
	22AS4	7/25	7/27	0.50	1.01	0.755	0.189
	23AS1	7/25	7/26	0.68	1.37	1.025	0.256
	23AS2	7/25	7/26	0.68	0.68	0.68	0.170
	23AS3	7/25	7/26	0.46	0.46	0.46	0.115
	23AS4	7/25	7/27	0.86	0.86	0.86	0.215
			AVE	1.31	1.75	1.53	0.382
CUBE	2SC-1:2	3/29/78	4/5/78	0.22	0.45	0.335	0.084
CUBE	2SC-3:4	3/29	4/5	0.21	1.07	0.64	0.160
CUBE	2SC-5:6	3/29	4/5	1.13	1.35	1.24	0.31
			AVE	0.52	0.96	0.74	0.185

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FIBER EVALUATION - LIBBY #1

AZ 1/11/17

DATE PROD.	MATERIAL IDENTIFICATION	SAMPLING CONDITIONS DATE	SAMPLING CONDITIONS LOCATION	FIBER ANALYSIS (f/ml) MIN.	FIBER ANALYSIS (f/ml) MAX.	AVE / TWA
3/23	TEST 4A CONTROL	3/29	DROP TEST	1.28	3.42	2.07 /
3/23	TEST 4B S.S. 0.37	3/25	DROP TEST	0.43	0.86	0.717 /
3/26	INVENTORY No Binder	3/29	DROP TEST	3.85	5.56	4.563 /
3/23	TEST 4A CONTROL	4/6	DROP TEST SAME AS A.F JOB	2.57	5.99	4.99 /
3/23	TEST 4B S.S. 0.37	4/6	DROP TEST SAME AS A.F JOB	<0.43	2.57	1.355 /
3/23	TEST 4A CONTROL	4/6	HOME SAMPLING ATTIC FILL	3.62	4.28	3.95 / 0.989
3/23	TEST 4B S.S. 0.37	4/6	HOME SAMPLING ATTIC FILL	1.94	2.53	2.235 / 0.559
			YANG BINDER TESTS		20082205	
5/11	TEST 9A CONTROL	5/12	DROP TEST	10.26	28.22	17.245 /
		6/1		6.91	8.55	7.553 /
		5/18	SIMULATED ATTIC	4.28	5.70	4.99 / 1.248
		6/2	20 4/CF BAGS	5.34	6.41	5.875 / 1.467
5/12	TEST 9B 2.0% STARCH	5/12	DROP TEST	1.28	9.83	3.848 /
		6/1		2.57	4.28	3.067 /
	1.0% PT. SIL.	5/17	SIMULATED ATTIC	2.92	3.15	3.035 / 0.159
	0.01% WAR	6/1	20 4/CF BAGS	1.60	2.14	1.87 / 0.488
	0.30 GIS/CF					
5/11	TEST 10B 0.5% CMC	5/12	DROP TEST	5.13	8.55	6.271 /
		5/31		1.28	5.99	3.063 /
	1.0% PT. SIL.	5/17	SIMULATED ATTIC	2.03	2.70	2.365 / 0.591
	0.01% WAR	6/1	20 4/CF BAGS	2.67	3.21	2.94 / 0.735
	0.31 GIS/CF					
5/11	TEST 11B 0.5% CMC 0.01% WAR 0.30 GIS/CF	5/12	DROP TEST	2.14	5.99	3.290 /
		5/31		1.28	2.14	1.523 /
			NO ATTIC TEST			

FIBER EVALUATION — LIBBY #2

12

7/24/77

	1	2	3	4	5	6
				FIBER ANALYSIS (f/ml)		
DATE PROD.	MATERIAL IDENTIFICATION	SAMPLING CONDITIONS DATE	LOCATION	MIN.	MAX.	AVE. / TWA
1	TEST 13AS					
2 5/25	SCREENED - 1/4 MESH	7/14	SIMULATED ATTIC	4.78	5.78	5.28 / 1.32
3	CYC. FINES PULLED.					
4	TEST: 16BS					
5 5/25	0.5% CMC	7/14	SIMULATED ATTIC	3.13	3.70	3.415 / 0.852
6	0.01% WAR					
7	0.20 QTS/CF					
8	TEST 16CS					
9 5/25	0.5% CMC	7/14	SIMULATED ATTIC	2.44	2.44	2.44 / 0.61
10	0.01% WAR					
11	0.40 QTS/CF					
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20082206

LIBBY : SIMULATED ATTIC ILSIS
SCREENED (16 MESH) — ALL CYCLONE FINES REMOVED 8/29/17

	TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS (f/cc) MIN.	MAX.	AVE	TWA 3/8
1							
2	18AS2	7/6	7/6	4.81	5.08	4.945	1.236
3							
4	18AS4	7/6	7/6	4.78	8.30	6.54	1.635
5							
6	18AS6	7/6	7/7	6.17	9.50	7.834	1.959
7							
8	18AS8	7/6	7/7	10.15	12.83	11.355	2.839
9							
10	26AS1	8/8	8/16	2.67	3.74	3.205	0.803
11							
12	26AS2	8/8	8/16	1.95	3.66	2.805	0.701
13							
14	26AS3	8/8	8/16	2.47	3.82	3.145	0.786
15							
16	26AS4	8/8	8/16	1.58	2.92	2.25	0.563
	OMAHA MAT'L	11/10	1/5/78	2.14	4.75	3.445	0.861
19							
20	TRENTON MAT'L	10/25	1/5	4.53	4.53	4.53	1.133
21							
22	DALLAS MAT'L	10/18	1/5	6.84	8.55	7.695	1.924
23							
24	EASTHAMPTON MAT'L	10/24	1/6	6.95	8.55	7.75	1.938
25							
26			AVE.	4.59	6.35	5.46	1.365
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20082207

LIBBY #3 SIMULATED ATTIC TESTS
SCREENED (16 MESH) - ALL CYCLONIC FINES REMOVED

TEST No.	DATE FOOD.	DATE TESTED	FIBER ANALYSIS (f/cc) MIN.	MAX.	AVE.	TWA 8/8
27AS1	8/8	8/10	1.07	1.28	1.175	0.294
27AS2	8/8	8/10	0.75	1.01	0.88	0.22
27AS3	8/6	8/10	0.75	1.01	0.88	0.22
27AS4	8/8	8/12	0.50	0.75	0.625	0.156
		AVE	0.77	1.01	0.89	0.223

20082208

LIBBY #3 SIMULATED ATTIC TESTS

SCREENED (20 MESH) = ALL CYCLONE FINES REMOVED

TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS (f/cc) MIN.	MAX.	AVE.	THK. 3/8
28AS1	8/8	8/16	1.66	2.14	1.90	0.475
28AS2	8/8	8/16	2.51	3.02	2.765	0.691
28AS3	8/8	8/17	3.09	4.04	3.565	0.891
28AS4	8/8	8/17	2.76	2.76	2.76	0.69
		AVE:	2.511	2.99	2.75	0.687

20082209

LIBBY #3 SIMULATED ATTIC TESTS

8/24/77

SCREENED (14 MESH) - ALL CYCLONE FINES REMOVED - REV. #1

ROUND 0.20 GTS/CF W/ 0.5% CMC & 0.01% DOWICIL

	TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS (f/ml) MIN.	MAX.	AVE.	THK. 2/8
1							
2	14 BS	5/25	7/13	1.51	1.76	1.635	0.409
3							
4	15 CS	5/25	7/13	1.76	2.01	1.885	0.471
5							
6	19 BS1	7/19	7/20	2.26	2.51	2.385	0.596
7							
8	19 BS2	7/19	7/20	0.49	0.98	0.735	0.184
9							
10	19 BS3	7/19	7/20	0.75	1.51	1.13	0.283
11							
12	19 BS4	7/19	7/20	0.50	2.51	1.505	0.376
13							
14	WEEDSPORT COMPOSITE	SEPT 77	11/6/78	1.07	2.14	1.605	0.401
15							
16			AVE.	1.19	1.92	1.55	0.389
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20082210

LIBBY – DYNAMIC IMPACT TESTS
SCREENED (14 MESH) – ALL CYCLONE FINES REMOVED. 8/21.
BOUND = 0.10 GMS/CF W/ 0.5% CMC & 0.01% DOWICIL

	TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS f/ml MIN.	MAX.	AVE.	IWA f/cc
1							
2	26BS1	8/8	8/15	3.13	3.70	3.415	0.654
3							
4	26BS2	8/8	8/15	1.81	3.63	2.72	0.68
5							
6	26BS3	8/8	8/15	3.47	4.01	3.74	0.935
7							
8	26BS4	8/8	8/15	2.90	3.21	2.905	0.701
9							
10			AVE.	2.70	3.64	3.177	0.793
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20082211

Screened (16 mesh) - All Cyclone Fines Removed 8/30/77
Round 0.10 QTS/CF w/ 0.5% CMC & 0.01% Dowicil

	TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS (f/ml) MIN.	MAX.	AVE.	TVA 3/8
1							
2	27851	8/8	8/9	1.90	2.61	2.255	0.569
3							
4	27852	8/8	8/9	2.14	2.61	2.375	0.534
5							
6	27853	8/8	8/9	1.96	2.04	1.95	0.498
7							
8	27854	8/8	8/9	2.14	2.35	2.245	0.561
9							
10			AVE	2.01	2.40	2.21	0.552
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20082212

FINISH - SIMULATED ATTIC TEST

SCREENED (20 MESH) - ALL CYCLONE FINES REMOVED

BOUND 0.10 GTS/CF W/ 0.5% CMC & 0.01% BIOCIDE

TEST NO.	DATE PROD.	DATE TESTED	FIBER ANALYSIS (F/mL) MIN.	MAX.	AVE.	THK 3/8
28BS1	8/8	8/17	3.37	3.63	3.50	0.975
28BS2	8/8	8/17	2.59	3.37	2.98	0.745
28BS3	8/8	8/17	2.59	2.95	2.72	0.59
28BS4	8/8	8/17	2.14	2.95	2.495	0.624
		AVG	2.67	3.18	2.92	0.731

20082213

FIBER EVALUATION - LEBY #3

7/21/11

DATE PROD.	MATERIAL IDENTIFICATION	SAMPLING CONDITIONS DATE	LOCATION	FIBER ANALYSIS (f/mL) MIN	MAX	AVE/TWA 8
7/6	TEST 18AS1	7/6	DROP TEST	5.56	8.55	7.415/
7/6	TEST 18AS2	7/6	DROP TEST	2.57	8.12	5.553/
		7/6	SIMULATED ATTIC	4.81	5.08	4.945/1.234
7/6	TEST 18AS3	7/6	DROP TEST	5.13	9.41	8.443/
7/6	TEST 18AS4	7/6	DROP TEST	7.70	13.25	9.335/
		7/6	SIMULATED ATTIC	4.78	8.30	6.54/1.635
7/6	TEST 18AS5	7/7	DROP TEST	7.27	12.40	10.42/
7/6	TEST 18AS6	7/7	DROP TEST	8.98	13.25	11.472/
		7/7	SIMULATED ATTIC	6.17	9.50	7.834/1.959
7/6	TEST 18AS7	7/7	DROP TEST	8.12	18.81	12.54/
7/6	TEST 18AS8	7/7	DROP TEST	8.12	23.09	13.44/
		7/7	SIMULATED ATTIC	10.15	12.93	11.355/2.839
7/6	COMPOSITE TEST 18AS2 18AS4 18AS6 18AS8	7/7	ACTUAL HOME ATTIC FILL JOB SAVANNAH N.Y. 24 HOUR BASS	7.97	11.22	9.95/2.239
	NOTE: TEST SERIES 18AS - ALL CELLULOSE FINES REMOVED & PRODUCT SCREENED OVER 14 MESH SCREEN					
5/25	TEST 14BS 2.0% STARCH 0.01% WAR - 0.20 QTS/CF	7/13	SIMULATED ATTIC	1.51	1.76	1.635/0.409
5/25	TEST 14CS 2.0% STARCH 0.1% WAR - 0.30 QTS/CF	7/13	SIMULATED ATTIC	1.26	1.26	1.26/0.315
5/25	TEST 15CS 0.5% CMC 0.01% WAR - 0.20 QTS/CF	7/13	SIMULATED ATTIC	1.76	2.01	1.885/0.471
5/25	TEST 15BS 0.5% CMC	7/13	SIMULATED ATTIC	0.75	2.01	1.38/0.345

20082214

Eaton
Desk Drawer Fwy Rt. (Left Section)
File: Consumer Products Safety Commission (2)
Eaton Box NN #4
2008215